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Unit IPOs in US: A comprehensive analysis on the offer choice motivation

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Biographical Note

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Between the bachelor's degree and the master's study, he completed is curriculums abroad in Czech Republic (VŠB-TUO), Spain (Carlos III University) and Poland (Kozmisnki University).

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Abstract

Going public often represents a challenge for most companies. Unit-IPOs seem to stretch a unique ability to improve investors' confidence offering a ‘sweeten to the deal’ (Schultz, 1993). Nonetheless, in a full information setting that should not matter (Chemmanur & Fulghieri, 1997). Warrants fundamental roll in IPOs didn’t yet find a consensus in the literature. The main purpose of this thesis is to test if these units are implemented as a substitution of other governance mechanisms or if they are used by already well managed companies who try to signal their IPO quality. Studying their governance structure and their individual traits, one should be able to gain additional knowledge to answer the question. The empirical findings, on this thesis, pointed to smaller and riskier companies as main issuers of unit offers. Whereas, they display weaker governance mechanisms ex-ante bid. However, when equating them with equity-only offers, they don’t appear to underperform. Supporting Schultz (1993) Agency-cost theory and adding to the current literature a new spectrum from US IPOs, with a time range between 2007 and 2017, that to our current knowledge have not been yet focus of study.

Key-words: Unit IPOs, Warrants, Governance Structure, Agency Costs, Signalling Hypothesis

JEL Classification: G34

Resumo

As Ofertas Públicas Iniciais representam, de forma frequente, um desafio para a maioria das empresas. Ofertas iniciais com emissão de unidades apresentam uma habilidade única para 'adoçar o negocio' (Schultz, 1993). No entanto, num cenário onde existe uma dispersão total de informação, essa adição não deveria ser relevante (Chemmanur & Fulghieri, 1997).
O papel fundamental de títulos de garantias em IPOs parece ainda não ter encontrado consenso na literatura. O objetivo desta tese é aferir se este mecanismo é implementado como alternativa ao uso de outros instrumentos de governança corporativa ou se em contraste é usado por companhias com boa gestão que tencionam sinalizar a sua qualidade. Com o teste das suas estruturas de governança, este estudo será capaz de responder às anteriores questões. Os resultados empíricos, desta tese, descrevem as empresas emissoras de unidades como menores e com um maior índice de risco associado. Revelam ainda que os mecanismos de governança utilizados são fracos ex-ante oferta. No entanto, quando equacionamos estas empresas com as que apenas emitiram ações, as primeiras não demonstram qualquer perda de desempenho relativamente às empresas de emissão única. Suportando assim a Teoria de Custos de Agência, Schultz (1993), e adicionando à literatura corrente, uma base empírica relativa a ofertas nos Estados Unidos da América, entre os anos 2007 e 2017, que perante o nosso atual conhecimento ainda não foi alvo de análise.

Palavras-Chave: Ofertas Iniciais Unitárias, Títulos de Garantia, Estrutura Governamental, Custos de Agência, Hipótese de Sinalização

Classificação JEL: G34

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Acronyms

CEO - Chief Executive Officer

CG – Corporate Governance

EBITDA – Earnings Before Interest, Tax, Depreciation and Amortization

IPO – Initial public Offering

NASDAQ - National Association of Securities Dealers Automated Quotations

NPV – Net Present Value

NYSE – New York Stock Exchange

PIPO – Package Initial Public Offering

QML – Quasi Maximum Likelihood

ROA – Return On Assets

SEC - Securities & Exchange Commission

SIC – Standard Industrial Classification

Chapter 1

I Introduction

The main intention of this research is the study of the inclusion of warrants in Initial Public Offerings in the United States of America.

Why do firms include warrants in their IPOs? There are currently two theories who divide the academic community on the subject. In one side, the Agency Cost theory formulated by Schultz (1993), that succinctly states that companies with greater agency problems tend to choose unit IPOs, arguing that they are used as governance mechanisms. In contrast, Chemmanur and Fulghieri (1997) Signalling Hypothesis claims that high-quality firms include these financial instruments in the offering to distinguish themselves from low-quality firms, affirming that firms who comprise units are trying to signal the quality of their firm and consequently are already well managed. Among the many supporters of Schultz theory (1993), there can be found numerous empirical proofs related to the efficiency of units as governance regulators, the core idea takes its position on the availability of cash-flows. As Michael C. Jensen (1986) remarks, managers tend to invest badly when they have excess of free cash-flows. Unit IPOs can work as a 'staged financing' similar to what happens with Venture Capitals, restricting the free cash-flow problem.

As stated by Chemmanur and Fulghieri (1997), their hypothesis didn't intend to be a direct confrontation to Schultz theory, focusing on the signalling dynamics and relying in Leland and Pyle (1977) previous models. Nonetheless, the subsequent literature faced both theories to each other as if they were in a dispute, making them the most accepted in the field.

Although IPOs are a well-studied realm in the field of Finance, unit offerings are less explored and crowded with unanswered gaps. Some studies such as Zhang (2010), Howe and Olsen (2009) and How et al. (2001) provided several arguments to fill some of them. This thesis aims to do the same, with an introspective analysis on the companies who emit package offers. Concretely, this study will cover a period of the past 10 years on the NYSE and NASDAQ markets.

Moreover, the true motivation behind the emission of such financial instruments is not the only question who have not yet found consensus, the performance of this IPO scheme is also debatable. Do unit IPOs underperform shares-only Offerings? This research eagers to add further information to answer the former question, enlarged with supplementary investigation on the frequency of these type of IPO: Are they more common in bear or bull markets?

In line with the previous, this thesis will display evidences that support Schultz (1993) Agency Cost Theory, with strong indicators to the higher performance of equity-only emissions and the non-existence of unit-offers in bear-markets.

The present report shall diverge from the prior literature as the following: First, in the time scope. Whereas to our current knowledge, no previous published paper examined this offer type between 2007 and 2017 for the aforementioned US markets. Furthermore, the introduction of the Energy SIC, as a proxy for volatility but more importantly as an implementation of Chemmanur and Fulghieri (1997) theoretical imagined unit company that intends to signal its quality. Lastly, the analysis of the delisted companies by year, shall bring additional information about the behaviours of such offers in different market conditions.

Besides this section, this report is divided in: Section 2, consisting with the relevant literature review, exposing the main theories and authors' insights; Section 3, describing the hypotheses to be empirical tested; Section 4, explaining the methodology to test the hypothesis; Section 5, presents the models and the respectively interpretations and Section 6, presenting the conclusions. Moreover, the annexes, include a section dedicated to the Energy SIC, a comprehensive table with variables correlations, the frequency of returns of both offers types and two additional Probit models.

Chapter 2

II Literature Review

Before connecting the main theories to be study with the empirical data, is fundamental to understand how units fundamentally work and how does the different types of offer, defined in different stages of the company life, can influence their behaviour. In order to preserve additional context, this thesis will also provide the basic definitions of offer types and dive into the surface of important corporate governance structures.

2.1 IPO

An Initial Public Offering is understood as the first offer on the primary stock market. Although, there are also structures who allow debt initial offerings and other types of deals, the focus of this thesis will be solely about equity sales, therefore any reference of IPO will only regard equity offerings. On a simplistic definition, is the first sale of the company shares where any outside investors can enter in the trade.

When a private company requires additional capital, to maintain or increase a certain level of growth, many instruments are available to help. Debt is usually the first one to be chosen, ranging from short term commercial papers to long-terms bond emissions. This type of financing is seen by many as the primary source of capital, some even argue about the positive impact of the debt in the corporate governance of the company. Black and Gilson (1998) states that the increment of debt works as an incentive

to the managers. So, why do companies decide to go public? Why managers decide to lose part of the company ownership to raise capital?

As empirically shown by J. R. Ritter and Welch (2002), companies seem to engage in their IPO after a certain stage of their life-cycle and if the market conditions are favourable to the issue. Encompassed with the du

Moreover, when a company is backed by a Venture Capital there's also an additional pressure from their side, since the usual behaviour of a VC is to avoid unnecessary long-term investments, trying to exit through an IPO as soon as possible. Closing their position and distributing the profit by their own share-holders.

On the other hand, going public can a risky manoeuvre, the costs of going public can be very lofty, conforming to J. Ritter (1998), there are two types of costs: direct and indirect. The former, encompass the bureaucratic expenses overdue by the regulators, underwriter fees and any other expenditures related to the process itself. The indirect costs include can be inputted into different fronts. First, the costs to the current shareholders who will suffer a potential loss of control due to the share dilution. Second, for both the company and the investors, the fluctuation on the valuations can be very harmful, leaving the current shareholders in the hands of the market. Furthermore, the aggressive take-overs are usually the main concern of the managers. Often used to share their ownership with trustful investors and Venture Capitals who shared the same goals than them, now they are face with threatening competitors who are hungering to take a competitive advantage, sometimes translated by unwanted take-overs. In addition, there's also the increased probability of losing sensitive information to this competition, not only by the required discloser of information required by the regulators, but also by scrutiny of the many more financial followers who know have incentives to close monitor the company.

The first step for the company, who wish to go public, is to find an underwriter. The theoretical concept of underwriting is no more that the intermediation between the issuer and the public who will take the part on the transaction. Usually, this process is shaped by highly reputed investment banks. Nonetheless, there are other factor beside the reputation. Industry awareness is sometimes chosen over the latter. Moreover, the financial institution will help the company to complete a series of actions, some with legal character others related to all the marketing evolving the auction. Moreover, the

agreement between both parts can take different boundaries. Conventionally, firms enrol in one of the following deal types: Firm-commitment, Best effort agreement or Syndicate of Underwriters (Smith, 2003).

Commonly recognized as one of the most employed methods, firm-commitments are based on the underwriter wiliness to buy all the shares and take full responsibility to sell them on the market. As stated by Smith (2003, p. 208), "*A firm commitment is like money in the bank…*". Although it's true that the underwriter accepts most of the risk, this type of deal is often backed by investors who already made written agreements with the underwriter, avoiding potential losses.

Differently, in a best effort agreement the financial institution doesn't give any guarantees regarding the output of the offer, in an oversimplified way, it only sells the shares to the interested buyers.

After the offer type is settled, the underwriter needs to complete a series of legal and bureaucratic processes, that in many devolved markets counts with engagement letters, letter of intent, underwriting agreement, registration statement, red herring documents, prospectus, and many others.

The regulatory approval allows the issue to proceed to the next stage and thereafter to the final price and number of shares to be allotted. Nonetheless, the previous step is often the spotlight of one of the most studied characteristics of IPOs: under-pricing. Although underwriters are "usual players" in the market and have all the incentives to correctly set the prices according all the available information, they repeatedly under-price IPOs. (Roosenboom, 2012).

Some of the most accepted explanatory models stand on the presence of asymmetric information. Although underwriters and issuers work to the same goal, the IPO success, they also take into consideration their own utility maximization. In another words, it can be advantageous to the underwriters to reduce the price in a past offer to increase the buyers' fidelity and trust on them. Furthermore, the same picture can be painted for the issuers, who's taking into consideration a possible future offering (Seasoned offering / Follow on).

2.2 Unit IPOS

Among the many definitions of unit IPOS, the humblest description explains them as an offering that contains a package of stocks and warrants. Although it can be globally recognized by the former terminology, some better know them by PIPOs, 'Package IPOs' (How et al., 2001).

Unit IPO's started to have a greater connotation in the earlies of twentieth century. Companies realized that the inclusion of instruments like warrants, could 'sweeten' the deal of their first offerings. Giving away an extra part of their ownership, the company could offer an apparently more profitable arrangement to outsider investors. However, the strategy rose opposing questions about it.

When all information is available on the market and a 'full information setting' is observed, there's no justification for the usage of these instruments. The market should assess the fundamental value of the IPO without the inference of an overvaluation due to the usage of warrants. Nevertheless, some companies still emit them. To answer this paradox, some literature (Chemmanur & Fulghieri, 1997) argue that when full market efficiency is not present, these mechanisms can be used for different purposes, as its proposed by the Agency Theory and the Signalling Hypothesis.

2.3 Warrants

One of the first written definitions of warrants comes from Fried (1960), defining them as endowments to its owner who grant the right but not the obligation to convert them into a common stock in a pre-defined proportion and with a specified strike price, with or without time range as a constraint. In his approach the author reveals them as a unique tool of speculation, as the book title suggests. Although they work much as call options as stated by Galai and Schneller (1978), being integrally a derivative upon the firm stock price, they have some fundamental particularities that make them an exceptional financial tool used in a variety of branches from risk management to speculative actions. According Abinzano and Navas (2013) these instruments mainly take two forms: Covered warrants or corporate warrants. When comparing the latter, the focus of this research, with standard call options two major differences should be highlighted, the issuer and their convertibility process. In warrants we have as the issuer the firms themselves who ascribe the peculiarity of its convertibility, while call options are exercised in exchange of a stock who's already marketable, when a warrant is exercised a new issue takes place, in other words the company issue a new stock to fulfil its part of the agreement.

Although these instruments are largely used and valued by practitioners, some may argue that they are neglected by the literature when equating with other financial derivatives. Nonetheless, there's still a considerable demand for them, where different types of innovations have flown this market.

W.-G. Zhang, Xiao and He (2009) warrants into two main categories: American and European. Like other derivatives, these types depend on the exercise time, they can additionally be divided in call warrants or put warrants. Moreover, the issuer can also derive. Although the main characteristic of these instruments is apparently funding the firm operations, there are warrants that do not fulfil that goal. Unusually they can be separated into other smaller subgroups, mentioned before, such as corporate (equity) warrants or covered warrants.
Being the latter allotted by third parties, for instance banks or other financial institutions. Warrants scope can seem already wide, but financial innovations are constantly happening, and covered warrants can be even more delimited by new introductions such as turbo warrants.

2.4 Corporate Governance

For years academics are trying to understand the internal mechanisms that distinguish a well-managed company from a company with internal problems. Furthermore, from the investor's perspective is also fundamental to recognize the two types of company's ex-ante investment. Many researches understand that the key point to categorize them start in the board of the company. Thus, is essential to understand the board role in a company performance. Although the topic is broader that what this thesis can address, some key concepts, from multiple authors, will be discussed being vital to the development of the main theories analysed in this investigation.

2.4.1 Board role and CEO Duality

Every public company has a board. More than a formal and legal requirement, having a board can be compared as having a pillar who sustains a building, the pressure exercised in the pillar may vary from building to building, but nonetheless is essential to the stability of the same. Boards have been extensively studied for more than one century, albeit the broader knowledge surrounding the topic the optimum board layout can still be debatable. Nevertheless, its role is clear, work as the last instance of the power in any company.

When examining a board structure, one question may arise, who should lead this ultimate mechanism of governance? Classically the common thought can acknowledge the CEO as the perfect contestant, however the financial literature may disagree. Quoting Fama and Jensen (1983):

"The decision processes of some open corporations seem to be dominated by an individual manager, generally the chief executive officer. In some cases, this signals the absence of separation of decision management and decision control, and, in our theory, the organization suffers in the competition for survival."

Ceo duality is understood as the conduction of multiple roles by the Chief Executive Officer of the company, specifically his role as chairman of the board. The opposite,

where two different people exercise the positions, is recognized as an independent structure.

According Rechner and Dalton (1991), this double position can condition the board main purpose: 'monitor the performance of the top management'. Companies with CEO duality are usually more inflexible and restrain the board ability to performe an efficient corporate governance. Picturing this behaviour as ineffective, the authors assessed the impact of the two management styles and predicted what would be the optimum leadership separation between the production side of a company and the company goals.

Other literature, as Boyd (1995), aligned its empirical research with Jensen's agency problems theory, where an agent the (CEO) has conflict of interests with a second party (shareholders), Boyd (1995) defends that when the major decision maker (chairman) has his goals not aligned with the shareholders' interests, as most CEOs don't own the majority of the firm's capital, there are very strong incentives for the CEO to try to maximize his wealth forfeiting the stakeholders interests or simply to minimize his own risk.

Therefore, is easy to picture that many governance decisions can become to be biased, not only because of the many incentives that the CEOs gain with this dual position, but also as result of the increase number of disagreements that can arise from the extreme concentration of power, not only in the board but in the company itself.

In their empirical finding, Rechner and Dalton (1991), examined a sample of 141 public US companies, reaching the astonish number of 78.7 percent elections for duality. Although the trend seems to be fading, as result of multiple criticisms by the medias and by the relentless pressure for the perfect board structure, sided by the increased requirements from SEC. Furthermore, previous researches such as Boyd, connected directly this behaviour with company's low performance, notwithstanding, the results were not statistically significant for every scenario, opening space to some interesting considerations to the fact that different levels of uncertainty may lead to different results. Meaning, that perhaps there may be times, in the life of a company, where this duality can in fact be beneficial.

2.4.2 Board Size, Independence and Debt

In concordance with the previous literature, the board size and board independence are intrinsically connected with the firm performance. Kang (2007), Bhagat (2001), Guest (2009). Although, there may be a lack of congruence on the behaviour of each factor, contrasting when environmental variables or frameworks are changed. There's a consensus when it comes to their relevance.

The long-studied relation between board size - firms' performance, is generally accepted by the literature as inversely proportional when controlled by sized. Jensen (1993), described the scenario of disagreement inside a large board, as result of loss of efficiency and discoordination.

Further, Guest (2009), defined the relationship as negative correlated, after analysing a set of 2,746 British companies. In a different setting, Eisenberg (1998), analysed a sample of small 900 Finnish companies. Moving from the large Cap firms and the US environment. The authors' study presented evidences of a board-size effect. The results pointed for the dependent relation between firm size and board size.

In contradiction, the board independence, is commonly accepted as a fundamental requirement for an efficient board. More than a necessary manoeuvre to control the CEO, as suggested by Bhagat (2001). It's important to improve the communication and to spread new ideas across the members (Kang, 2007).

Lastly, the presence of debt is recognized by Jensen & Meckling (1976) as substantially important when accessing the optimal capital structure. Working as an additional monitoring mechanism, who promotes the reduction of agency costs. Its effect is based on a double effect, that thrives from the assumption that the increase of debt, also increases managers pressure and incentives to reduce any Agency Costs present on the firm. Moreover, the monitoring role of the creditor, who wish to secure the investment, also appears to be relevant in Datta (1999) empirical findings.

2.5 Agency Cost Hypothesis

The Agency Cost hypothesis, proposed firstly by Schultz (1993), sought to bring a new light to the forgotten realm of unit IPOs. Its main goal was to understand the relation between the quality of a firm and the issue of warrants. Although some previous studies about the subject were made, such as Fried (1960), until the authors' publication unit IPOs were a specie of guarantee to make investors safely invest in a higher length on their risk aversion horizon. The author characterized the issuers of these offerings as small, young and light assets companies, with a focus in the tech and service sector.

Schultz divided his research in three main different points: The cost of going public through unit IPOs; The Agency costs related with unit issues; The survival rates of these unit companies.

When assessing the cost of going public the author compared a sample of 630 companies who only emitted shares and 167 firms who went public with warrants emissions, from a period from 1986 to 1988. The findings, as Schultz had previously hypothesized, remitted to a higher cost of unit initial offerings when equated with comparable share only offerings. Moreover, the results pointed to even higher costs when nonaccountable expenses allowances were included. In order to justify his results, the author connects the risk bearded by the underwriter when issuing units with this higher cost, since the success of such offerings are usually lower.

In a broader approach, Dunbar (1995), makes an interesting linkage amid the reimbursement method and the costs associated with the unit IPOs. Backed by empirical data he unveils that using warrants as compensation reduce significantly the costs demanded by the financial institution, arguing that this miscalculation of the expenditures is due to a bad estimation, from the underwriter, who don't force firms to take the more expensive compensation contracts. Other literature such as (Barry, Muscarella & Vetsuypens, 1991), had already hypothesized that warrants offerings do cause greater under-pricing when compared with issues without warrants, making them costlier to the issuer, reporting that although there are riskier they could also help to reduce the information asymmetry by tying the underwriter compensations to future price performance.

The second point covered by the Agency Cost theory regards the choice of offering type and how it influences the costs brought up by an inefficient manager. Going public is a big step in a company life and can sometimes dictates its success or failure, aligned with the quality of the management to correctly invest the funds gathered by the issue, it can be stated that they are the foundations of the firm future. Schultz provides empirical data to support his theory: *"…unit IPOs are used to minimize the agency costs of free cash flows when it is difficult to determine whether a firm has worthwhile projects.*" (Schultz, 1993). This is true specially when the current equity is already diversified by external investor that have no managerial positions in the firm. Furthermore, when firm performance turns out to be bad and composed by unprofitable projects, managers have extra incentives to incur in agency costs, investing in weak projects, with negative NPV. Units issues can be used as a tool to fight this problem since the investment is staged, like what happen in a venture capital funding, managers don't have the total amount of cash available at one time, only if they prove the market the firms value they will be able to access the other portion of the capital. The latter creates a security line against bad managerial practices, limiting the potential amount of losses. Essentially, this type of offering allows that the funding generated by the units, such as warrants, can be used only if they are really necessary or in a notional connotation if the company grown enough to access them. Furthermore, Byoun (2004) also points to the fact that the high-performance companies will have a lower probability to need to assemble a future Seasoned Issue. When a company keeps growing, the corresponding share price is usually following the trend, approaching the threshold to exercise the warrant, this means additional funding for the Unit IPO company.

"The most efficient corporate governance structure will vary by firm depending on the costs and benefits of different governance mechanisms. For IPO firms, warrants might act as a substitute for other governance mechanisms" (Schultz, 1993).

As an inference for the previous point, it's fair to reason that unit offerings have a higher probability to fail than share only IPOs. The fact that the market needs to validate the quality of the firm, delaying the full investment, makes weak firms fails earlier. In other words, while in a share only offer, a bad firm can access instantly a higher amount of funds postponing its failure with different and more expensive projects. In a unit offering only the most adapted firms who can fulfil the market expectations can survive. Specifically, the second round of investment can only exist if the initial stage is

lucrative to the investors, only when the project is valuable, and the stock price exceeds the warrant exercise price.

As a last empirical key point, Schultz paper adds the failure likelihood for each category of IPO, confirming the implicit reasoning that unit offerings have a higher probability to fail than share only IPOs. It's important to highlight that adjustments to the offer size, firm age, offering returns and underwriter prestige were made.

2.5.1 Limitations

Although Schultz (1993) theory was an entry door to the study of unit IPOs, some authors such as Chemmanur and Fulghieri (1997) and Zhang (2010) claimed that his research has some dubious points.

The main argument describing that companies adopt unit IPOs to diminish agency costs, through the shrink of available cash-flows, can be brought to reasoning. According Michael C. Jensen (1986), managers tend to have incentives to surpass the company's optimal growth point. In a blunt form, since their remunerations are intrinsically connected with the firm's development, they strive to achieve maximum fruition and performance. Nonetheless, the connection with excessive investment can lead to unsustainable growth or even worse to bad investments.

This condition can affect all companies. If unit-IPOs were the solution to the latest problem, not only small and young companies would issue Unit-IPOs. In another words, its popularity among other type of companies would be greater, at least some tendency would be spotted by the academics. But then again, for Byoun (2004), the propensities are completely the reversed. The number of unit-IPOs has been decreasing.

2.6 Signalling Hypothesis

According Jensen and Meckling (1976), agency relationships can be defined as interactions between two or more parties, who have as goal the maximization of their utility regarding a specific interaction. Consequently, one party can have divergent ambitions from the synergy, leading to contrasting actions and therefore costs to one of the actors, usually the investors of the project or company. Following the idea that agency costs can be in fact a constraint when entrepreneurs try to get external financing, connecting with the vast literature about IPOs, Leland and Pyle (1977) explain the non-consensual under-pricing in this first offerings. Amid the massive theories about the topic, their signalling hypothesis propose that managers from good and effective companies use two main tools to distinguish themselves from inferior companies, who try to mimic their quality to attain higher funding.

Chemmanur and Fulghieri (1997) differentiate their model apart from the previous signalling hypothesis by two main factors. First, the authors exclude the previous literature constraints relating the premise that companies only signal their IPOs when strategizing a Seasoned Offering. Although their model can in fact be applied in these conditions, it's not mandatory that the existence of a second offering. Furthermore, the second variance from prior works stands on the inclusion of a package offering to entrepreneurs sign higher firm value.

The model presents two different companies: Company G and Company B. The former, defines a good company with high expected future cash flows, with undefined risk. The latter defines the contrast, a bad company, with lower expected cash flows and subsequently a minor potential Firm Value. Moreover, it's assumed an environment of uncertainty where asymmetric information is present, to distinguish the parties the authors define the insiders as knowledgeable and outsiders as risk-takers. The first category has all the information about the company, from the expected future cash-flows to the risk of the firm, nonetheless they still brace a level of uncertainty, since there's different probabilities for the different cash flows stages, the project performance can be very good, leading the company to an high stage, a medium and low are also possible with their designated probabilities that are also present in the model, in another words the insiders also have some degree of uncertainty regarding to how well will the project perform.

An important assumption concerning the insiders is that they are risk averse, in other words they don't want to incur in any type of unnecessary risk. The second group are the outsiders, who can only assess information like the risk of the firm by the availability of public information.

According Chemmanur and Fulghieri (1997) model, when modelling the problem in a free asymmetric information environment, there's no point to issue warrants. It's assumed that, both companies will disclose their true value, letting know the investors which company has the higher benefits, creating a pointless need to insiders signal their value and consequently the usage of units or any other signalling object.

"In the full information setting, insiders, being risk averse, choose to divest their equity holdings in the firm completely, since the time 1 value of the firm is uncertain. There is no reason for issuing warrants in the absence of asymmetric information." (Chemmanur and Fulghieri, 1997, p. 9).

In an asymmetric information scenario on the other hand the good firms, as Leland and Pyle hypothesized, will try to prove their value, trying to separate themselves from the bad firms, in order to do so three tools may be used: under-pricing, ownership retention and unit's emission. Simultaneously the B firms will try to 'mimic' the high value competitor, to get further financing, disguising as good firms and copying all the signals emitted from the rivals. Nonetheless the authors defined that they can only mimic to a certain extent, after some point it becomes too expensive to continue this artificial look.

Furthermore, authors archetypal is based in separating sequential equilibria, brought up by Kreps and Wilson (1982), who himself derives his model from previous literature, such as Nash equilibrium in order to enlighten the game theory. Following the conditions that both players follow a 'sequential rationality', where they both line their strategy with the unobservable choices made by the other party. The separating equilibria took (Chemmanur & Fulghieri, 1997) model to a new assumption. Outsiders reactions to any move of the companies are identified, leading to a conservation of funds from the company G. In a different preposition, this company doesn't need to invest unnecessary money to signal their quality, when the optimal level is reached, to assure the differentiation, the outsiders will know. That being said, it's also useful to take in consideration the emission's cost for both companies. While the company G is

calculating the units exercise price accordingly to its future expected returns, the B competitor is not. Since we have a proportionality between the ratio of warrants / stocks to its cost, it will be easier to the former company to increase this ratio. Meaning that company G is depending in its fundamentals and will have a higher probability to cover the unit's costs and reach a second stage of financing.

After the modulation of various scenarios, the authors arrived at several conclusions. First, when comparing firms apparently equal before the IPO, it's possible to assess that the riskier companies will emit their offer under-priced or/and will include warrants in it. In contrast, less volatile firms (with less risky future expected cash-flows) will emit share-only offers, nevertheless they will signal their quality with an under-priced value. Second, while comparing the different signalling options, Chemmanur and Fulghieri (1997), related them with the level of riskiness of the companies. Firms who used under-priced and emission of units will have a positive relation with firm riskiness, particularly the higher the under-pricing or higher the ratio of warrants/stocks, the higher will be the company risk. In dissimilarity, companies who retain ownership instead, should have an inversely relationship between this signal mechanism and the firm riskiness, in other words, the bigger the fraction retained by the insiders, the less risky is the firm. Finally, they claim that under-pricing can be a 'optimization strategy' to insiders achieve a higher personal utility. Within a trade-off between the fraction of ownership they want to keep and the signal they want to emit to the investors.

As final conclusion, the authors defend that units don't seem to be solely used to decrease agency costs. Companies type G, who are already well managed (with high expected cash flows), but also have high expected volatility are specially interested in signal their quality. Let us take a practical example. Two competitor companies who started on the tech business, one with strong fundamentals, the other with a weak business model and low expected cash-flows. Both will face a risky environment due to the complexity of the tech industry, except they have completely different rates of success that are yet to be proven in the market. The company with the higher expected cash flows have all the incentives to signal their quality with a future commitment to the investors (units' emission). On the other hand, the weak competitor will try to mimic this commitment, knowing they have lower probabilities to fulfil it. They will both emit units, independently of the firm management quality. On the other side, let us picture a firm with the same expected cash flows that the G firm of the last example, but in a more

mature industry such as retail, with a constant progression of return (low volatility). Although they share the same mean returns, the volatility will play a crucial role, the retail company can predict when they will be able to access these cash flows, in contrast the tech company are fastened to a roller-coaster of cash-flows, having the extra need to assure an optimal financing in its IPO and consequently the usage of units.

Chapter 3

III Empirical study

3.1 Hypothesis

As implied from the previous literature, it can be argued there are several gaps and lack of empirical researches relating units and their impact on company's corporate governance. The main goal of this research is to collect additional evidences about the topic. Filling slightly the void with an empirical analysis of unit IPOs.

Primarily the hypothesis to be tested stands on the premise that units are a substitute to other governance mechanisms. In a more detailed line, the goal of this study is to analyse if Schultz (1993) was right when he stated that warrants reduce agency costs. Therefore, test if they are employed as a complementary piece of a well-structured Corporate Governance dynamic, acting as alternatives to other mechanisms. Or, if in contrast, they are used to signal IPOs quality, as theorized by Chemmanur and Fulghieri (1997). In the latter case, it could signify that firms are already well managed, and the peculiar offer is employed as a technique to distinguish the good company from its less worthy competitors.

To reach a conclusion, the hypothesis should investigate the elements who reduce agency costs, explicitly the companies' governance structure. By evaluating the latter, we can define if unit companies are more efficient after their issue.

Secondarily, the research can also implicitly answer two additional questions: does unit offerings outperform the comparable share-only IPOs?

The latest, can provide additional arguments about the efficiency of these offers and about the companies who cast them off. In another words, it may provide supplementary clues about their real fundamental value and future cash-flows.

Although, that's not the focus of this research, this comparison can be in deed useful to establish a connection point between the IPO success and the management performance. Moreover, it can be helpful when establishing a relation between the firm riskiness and the usage of these instruments.

The foundations of this research stand on other studies who employed the same hypothesis as a driver. Howe and Olsen (2001) investigation collected data from 1996 to 2004 and found out that unit IPOs can indeed decrease agency costs created by available free cash flows of the company. Expanding the analysis from the previous work of Howe in 2001, where they essentially analysed the same hypothesis in a different set, namely in Australia, with a sample 134-unit offerings.

The hypotheses enumeration will progress as follows:

H1: Unit companies are smaller and risker.

H2: Share-Only companies have better corporate governance mechanisms in place before IPO.

H3: Units-Offers are used as Corporate governance mechanisms.

H4: Unit-Offers will have greater future volatility.

H5: Share companies will outperform unit companies.

H6: Unit firms will fail faster and more often than the counter-party.

By way of materialization of the reviewed literature, the above six statements, shall be tested in the next chapter by the means of visualization, descriptive analyses and regressions.

The first hypothesis should be tested in concordance with Schultz theory, where he states that unit companies are characterized as smaller, risker and younger.

Moreover, the aftereffect of H2 is one of the key points of this research. Are unit companies already well managed or do they suffer with increased agency problems? The

answer shall provide additional arguments to the contrast between the two main theories. Where, Schultz (1993) defends that unit-companies use the choice offer as a way to improve their corporate governance mechanisms. Alternatively Chemmanur and Fulghieri (1997) have theoretically shown that units IPOs are already well managed and try to distinguish themselves with units' emissions.

As final conclusion H3, shall be rejected if there are not enough evidences to support Schultz (1993) empirical findings. Matching with the previous test, H3 may illustrate a bigger picture about the disagrement between the authors.

H4 intends to test Chemmanur and Fulghieri (1997) remark that although units' firms are not necessarily less valuable, they will be more volatile. Here the position on units is theorized as an assurance to investors, a signal of quality. The preposition stands on the absence of full market efficiency.

Furthermore, H5 shall suggest if there’s a pattern of efficiency to each company group. Here Schultz (1993) theory quarrel with Chemmanur and Fulghieri (1997) model, where the latter states that unit companies can be as valuable as the counter-party.

Therefore, H6 is a necessary complement to the latter H4 and H5, where evidences of higher fail rates on units companies would provide a substantial agreement with Schultz (1993) empirical findings. In his study, the author conclude that share-only companies failed more often than unit-offer firms. Three years after the listing 88.9% of equity-only companies were no longer listed. Contrasting with 58.8% of the second groups who had being delisted from the NASDAQ market.

3.2 Methodology

3.2.1 Data

The data collected consists in three main categories: Offering details, Firm characteristics and Governance Mechanisms.

Initially the data was retrieved from Reuters DataStream Deal Screener. Enclosing 126 unit-IPOs and 1059 share-only IPOs with market capitalizations in NASDAQ or NYSE, ranging in the data period between 2007 and 2017. Subsequently, unit trusts and real estate companies IPOs were excluded from the sample. Resulting in a final sample of 105 units companies. From the share-only IPOs sample, a random selection of 111 companies was made, where the same treatment of unit trusts and real estate companies took place.

Moreover, due to data constrains, the corporate governance variables were manually collected from the company's prospectus at date of offer, collected from SEC website, mostly in form of S1/A submissions. According the registration statement by the Securities Act of 1993, the report must provide all the necessary information to ensure an educated decision, based on the worthiness of the firm. Other variables such as offering details were also collected and adjusted manually. Although some foreign registrations were also considered in the analysis, forms F1/A, the majority were from American companies.

Since one of the fundamental purposes of the findings is to categorize the type and structure of each company, no market capitalization control took place at the selection of the sample. Instead posterior control variables were calculated to assure size control and normality.

Finally, the global data set comprised a total of number of 216 companies confirmed deals, varying from different sectors, since tech companies to mining companies. Not unexpectedly most companies who followed the emission with units are located in sectors such as mining, energy and pharmacy, usually industries with higher volatility of returns.

3.2.2 Variables and Introduction to the Methodology

Initially, our dataset was separated into the different types of offering choices, Package units and shares-only stocks.

The first step is to investigate the descriptive statics for each offer type and try to find a relevant interpolation about their unique characteristics, tracing a dynamic relationship with the literature.

Measure	Proxy
Size	Total Assets Offer Size
Volatility on Cash Flows	SIC (Energy) Daily Stock Price Change
Profitability	ROA
Corporate Governance	Board Independence Board Size Total Liabilities to EBITDA CEO Duality
Performance	Survival Status Daily Stock Price

Table 1. *Variables Approximations – Source: Own Elaboration*

The variables selection is crucial to a consistent analysis. As stated by James J Heckman (1977), the selection bias may arise when an analysis is grounded on non-random samples, that often occurs when data is missing for the dependent variable. In another words, when the data is very submissive the sample elected is tendentially less random.

In contrast with other problems, as the scarcity of data, on the independent variables, the selection bias problem may also crop up at prime levels of the variable itself. Due to the awareness to the data limitations on the fundamental levels of this research, we tried to mitigate the problem as much as possible. Carefully selecting the variables, prior, the model's construction, basing them on the above discussed literature.

Bestowing the previous mentioned division, the variables can be breakdown in three groups: firms characteristics, offering details and corporate governance mechanisms.

Firstly, on the firm's characteristics the analysis will exploit the humble but efficient classic valuation ratios. As a proxy to size, the amount of Total Assets was

elected. The variable is especially relevant to test the argument that companies who chose Package offers are in average smaller than share-only firms. Based on Schultz (1993) empirical findings, the amount of total assets should be greater to equity-only companies.

Secondly, as a proxy for profitability, this study selected ROA, vastly used in the classical literature, this ratio shall give additional insights about the income generated to the shareholders per offer type. Defining the performance of the groups before the first sell. The current ratio was also considered, to approximate the possibility that, further than smaller and younger these companies are also riskier. According Altman (1968), the latter measure is commonly associated with low liquidity levels and consequently lower current ratios

Subsequently to its crucial role in this study, volatility is approximated by multiple variables. First, by the daily stock price changes from the time-range of the analysis. Therefore, we based our choice in the belief that there is some high degree of efficiency in US markets.

Moreover, as a complement to the volatility measurement, we decided to use a binary variable to enclose industries with high volatility in their cash-flows. Whereas, companies in industries connected with the production/extraction of energy commodities, shall be included in the variable SIC. As per fundamental behaviours, energy stocks look as much as Chemmanur and Fulghieri (1997) definition of unit companies. With a big potential for high future cash-flows, they also experience big volatilities as result of their big exposition to commodity price changes.

The offer details were comprised as the offered amount divided by the total assets, although this variable seems biased, due to the different asset intensity between sectors, we decided that a variable to control size was required. Data was enriched with NASDAQ website information's relating the IPO.

As corporate governance indicators we privileged: board size, number of non-executives on the board, CEO duality, number of independent members in the board, CEO age and a solvency ratio of total liabilities to total assets.

Regarding the board size, as discussed in the previous sections and stated by M. C. Jensen (1993), its efficiency as a governance mechanism is negatively correlated with its size. In other words, larger boards do a worse job. The bridge with our hypothesis can be stated

as the following: If the average board size of unit IPOs companies are larger than share-only, we have a flag pointing in the direction of Schultz (1993) hypothesis. Contrarily, if we found smaller board sizes to unit IPOs, we can trail Chemmanur and Fulghieri (1997) theory.

Furthermore, M. C. Jensen (1993) also argues to the fundamental role of the number of outsiders and their amount of ownership, the board independence and the separation of leadership (measured by assessing if a CEO also have the Chairman position). Howe and Olsen (2009) also pointed to the level of debt as a variable, since it contains an important monitoring role. All the previous variables shall be used to support or disclaim the main hypothesis studied in this thesis, painting a wider picture about the real roll of warrants in IPOs.

Finally, basing on the previous literature, we exploited the survival status and the daily stock price. The former variable is defined as a dummy variable, where company who were listed at the end of December of 2017 were distinct as 1 and delisted companies as 0.

Additionally, the daily stock price will be handoff as an approximation of firms' performance.

The next section shall present all the descriptive statistics between units and stock-only companies. As a first line of comparison, the study will perform a statistic descriptive analysis to stablish relationships, equating the offer types means differences. As a first instance, it will allow to draw a line between the fundamental firms' characteristics connecting them with their respective offering type.

Next, due the nature of our analysis, with a dichotomous dependent variable, where we are defining the type of the offering as Package (with units) or Share-only, a Probit model will be applied. Considering a binary model, where our variable can only be in two states.

The goal with the latter analysis is to evaluate the likelihood of any of the two offering types to be chosen, conditioned by some independent variables such as the corporate governance mechanisms or the fundamentals of the company, we should trace a relationship between the findings and the past literature. (more in the methodology/models' section)

The preference of a Probit model arrives from the specific questions elevated on our hypothesis. According Stone and Rasp (1991), the choice between Logit/ Probit and OLS models can be largely debatable. In their research, the authors simulated the procedure of both models with binary responsive variables (same as our offer types). The conclusion revealed that for samples with more than 200 entries, in fact the logit or Probit models can be more efficient.

3.3 Descriptive Statistics

The collection of the end sample was a result of the data treatment detailed in the beginning of this chapter. Organized by a group of 111 companies who went public with shares-only and a group of 105 firms who decided to go with Units first Offerings, with a total sample size of 216 deals.

The below table 2 summarizes the main statistics collected and unglued for each offering type.

Mean Variable	Group 1 Shares	Group 2 Units	Total
AMOUNT OFFERED	320,149.26	201,757.33	262,597.62
AMOUNT OFFERED BY TOTAL ASSETS	1.35577	6.01986	3.62303
BOARD SIZE	11.9099	9.03810	10.5139
CEO DUALITY	0.29730	0.51429	0.40278
CURRENT RATIO	0.99045	1.14582	1.06597
DAYS TRADED	1,198.5225	823.266667	1,016.1065
DELISTED	0.70270	0.56190	0.63426
EBITDA	278,082.91	199,511.53	239,888.49
BOARD INDEPENDENCE	5.42342	3.33333	4.40741
NUMBER OF NON-EXECUTIVES	5.72973	4.29524	5.03241
SIC VARIABLE	0.04505	0.60952	0.31944
TOTAL ASSETS	3,883,926	2,291,584	3,109,871
TOTAL DEBT TO EBITDA	9.04378	2.59191	5.90745
TOTAL EQUITY	688,529.77	877,695.52	780,485.35
TOTAL LIABILITIES	3,195,396	1,413,954	2,329,417
CEO AGE	51.50450	52.36538	51.92093
ROA	-0.40859	-0.52371	-0.46455
Standard Deviation Variable	**Shares**	**Units**	**Total**
AMOUNT OFFERED	1,512,111	188,894.4	1,091,148
AMOUNT OFFERED BY TOTAL ASSETS	6.87646	52.4543	36.8862
BOARD SIZE	3.42597	2.98691	3.52001
CEO DUALITY	0.45914	0.50219	0.49160
CURRENT RATIO	4.18134	4.17576	4.16963
DAYS TRADED	700.8701	571.3960	666.7786
DELISTED	0.45914	0.49853	0.48276
EBITDA	2,201,063	424,508.1	1,602,309
BOARD INDEPENDENCE	1.89521	1.90983	2.16757
NUMBER OF NON-EXECUTIVES	2.15721	2.35308	2.36129
SIC VARIABLE	0.20834	0.49020	0.46734
TOTAL ASSETS	21,233,700	5,252,026	15,641,512
TOTAL DEBT TO EBITDA	70.04715	32.49281	55.05912
TOTAL EQUITY	3,383,462	2,497,251	2,980,371
TOTAL LIABILITIES	17,981,950	2,952,700	13,055,608
CEO AGE	7.697548	7.531239	7.611985
ROA	2.26884	3.55225	2.95649
Observations	111	105	216

Table 2. *Descriptive Statistics divided per group offer - Source: Own Elaboration*

While analysing the above table it's important to recall that the Shares-only sample was selected as a random collection of the total deals with only shares emission.

It's possible to assess that the amount offered, number of shares times the offer price, in the first group is substantial higher. Nevertheless, when the same value is controlled by the firm size proxy, the picture changes sides instantly. It's now inferable that the influence of the latter is somehow significant. Although, this can be explained by the asset's intensity of the each of the groups, when we look for the standard deviation of units offer size, we may withhold the thought that it doesn't vary much. However, a deeper investigation to the variance of the Total assets and the division between the offer size controlled by firm size lead us to some contradictory inferences about the true dispersion of the offers.

First, Units companies appear to be smaller than shares only. With an average of round 2.3 billion worth of assets, this group is meaningfully minor than the competitor with a mean of about 3.9 billion. It's also interesting to investigate their standard deviation. With an astonish difference between the values it can be suggested that the sample includes major differences between the individual share's companies.

Notwithstanding, both samples have a vast number of large z-scores and while the standard deviation of amount offered by shares firms seems to run along with their assets variance, the same is not happening with the units companies. Resulting in a hefty difference in the standard deviation of units' companies. As an interpretation, we can presume two scenarios. One, the latter firms try to access to the same amount of capital from the primary market overlooking their own size. Thus, signalizing a first hint to Chemmanur and Fulghieri (1997), who states that less valuable companies will try to mimic their highly deserving competitors. Or, in opposition, units' companies may operate in industries where the assets intensity is lower. To get into the root, a oversee of the SIC can provide a complementary guidance.

Furthermore, it's notable the connection of the previous facts with Schultz (1993) first argument. Unit companies, in deed, appear to be smaller than Stock only firms.

Assigned as a dichotomous independent variable, SIC was assigned as 1 if the company is operating in any sector related to the energy sector and 0 if it doesn't. In the

table 2, it's possible to picture the large difference between the two samples. Around 61% of the companies relate to the sector, rivalling with the modest value of 4 % for shares-only.

One may argue, that the random selected sample for shares only may fall outside the normal distribution of the universe in USA. To mitigate that, a comprehensive analysis to that particular variable over the total population of share-only IPOs was conducted as per the below table.

Energy SIC for the entire universe of IPOs

Sample: 1 1888	
Mean	0.055085
Std. Dev.	0.228206
Skewness	3.900275
Kurtosis	16.21214
Jarque-Bera	18518.86
Probability	0.000000
Sum	104.0000
Sum Sq. Dev.	98.27119
Observations	1888

Table 3. Variable *Energy SIC - US Universe equity-only offers from 2007 to 2017 - Source: Own elaboration*

The findings are very similar to the ones in our small sample. With a mean of approximately 6 % of the total IPOs, only 104 companies connected with the energy sector [1] ever gone public, with shares only, between 2007 and 2017 in the USA primary markets. Equating the 63 corporations who chose unit offerings, it's fair to say that from the total of 167 energy companies, who collected money from the primary market, in the period, about 38 % decided to offer units as a complement.

Due to the volatile nature of the energy sector, driven by commodity prices, one may additionally argue that the above results strongly support Chemmanur and Fulghieri (1997) predictions. By way of explanation, the latter companies have a peculiar characteristic of having higher volatilities in their cash-flows. Coupling with the authors

[1] To a broader explanation on the SICs included please refer to the annexes, table number 2.

model, who states that companies with high valuable cash flows with big standard deviations have more incentives to go public with units' offerings. It's also worth of pointing the relation with Schultz (1993) results, unit companies seem to be riskier.

Although, the corporate governance variables are not so distinctive as the previous, it's possible to distinguish them between the two groups.

Starting with the board size, in average, share-only firms have bigger boards. With the latter having a mean of 12 members per company, compared with 9 members for units' firms. There's also the size factor that must be taken into account. As inferred before, share-only companies are larger than the second group. Meaning that they can have bigger boards simply as result of their dimension. Furthermore, it's also central to analyse the standard deviation of each offer type. Shares have a superior variance, that leads to a congruent conclusion with the previous statement, mainly due to the size differences between the samples.

When it comes to board independence, the results point to a substantial difference of 2 independent members. Whereas, the conventional offer type has the lead of about 5 outsiders compared with only 3 for structured offers. Likewise, the aforementioned variable, the number of independent members must be interpreted with caution considering the dimension of the particular group.

Additionally, the number of non-executives appears to fluctuate slightly between the sets.

When evaluating the last two variables, is important to notice that SEC regulations and standards, do have a major impact in their outputs. Even though companies have the potential to elect any type of board, there are specific lowest that are suggested by the entity.

In the latest, 2016 memo circular nº.19, "Code of Corporate Governance", SEC defines a cluster of recommendations to listed companies. As stated by the entity, these recommendations are the core foundations for a healthy governance.

In the matter that, in the recommendation 5.1, SEC advices that the minimum number of independent members, should be at least 3 or in case of large boards 1/3 of the panel size. Alongside, the recommendation 5.7 suggests that an increased number of non-executive officers can be beneficial to dissect the board performance.

Moreover, the recommendation 5.4, SEC states that CEO duality should be avoid. Where, the CEO should not exercise the role of Chairman. Despite that, our results suggest that the latter recommendation is vastly ignored. With around 51% of units' companies and 30% of shares-only companies not following it.

The CEO age doesn't seem to differ much between sets, with a rounding average of 52 years for both companies.

In the matters of total Liabilities, Share-only companies seem to have the lead, with a mean value of 3 billion against roughly 1,4 billion from unit-shares. Nonetheless, when we measured and control the variable with the earnings there's a clear picture about the engagement of each company type. The latter has now a Total Liabilities to Ebitda ratio of around 9.04 against 2.59 from the former. With low volatilities in both cases. Jointly with the others Corporate governance mechanisms, it's possible to infer that Share-only companies go into their offers with higher levels of debt. When considering the amount of total Liabilities as a proxy of the amount of total Debt, it's clear that the first group have extra exposure to creditors pressure, monitoring and control, coextending Schultz (1993) predictions.

However, when we ponder the ROA, calculated taking the EBITDA divided by the total amount of assets, both groups seem to be on negative territory, with close averages ranging (-0.41%) and (-0.523), for group 1 and group 2, respectively. In contrast with the positive mean EBITDA, these negative values can be simply explained by a portion of companies who have a scanty of total assets and hefty negative EBITDAs, altering the mean ROA to adverse grounds.

3.4 Energy SIC

As a counterparty for the daily stock price change, we attempted to assess the influence of sectors connected with Energy SICs with the choice of units offers. To back up our choice we back-tested an ETF who tracks the US energy stocks and compared it with a SP500 Benchmark.

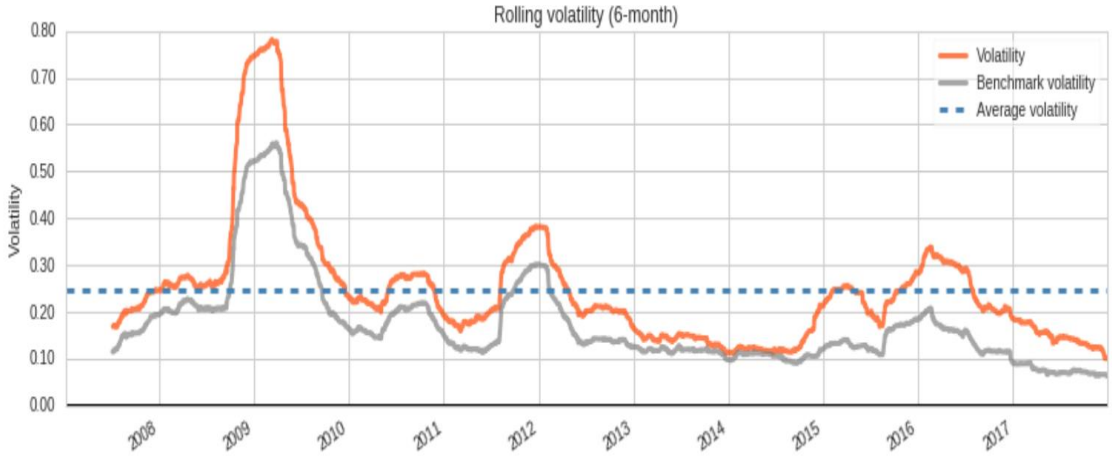

Figure 1. *IXC volatility, between 2007 to 2017, when backtested against SP500 Source: Quantopian Platform*

As per the above image, the volatility on IXC is visibly higher, with the peak reaching 2008 financial crisis for both groups. With a clear trend on the unfolding time series, the energy SIC standard deviations were always bigger in the past ten years.

However, it's also noticeable the high correlation between volatilities, nonetheless it's also important to take in consideration that the diversification of an ETF is always lower than the actual SP500 index. To mitigate, this diversification effect, we back-tested the correspondent SP500 ETF - SPDR S&P 500. Although, there's still the factor that accounts for the sector diversification on the index, a distinct image can be taken when we compare what's in essence the average volatility for all the sector.

Start date	2007-01-05
End date	2017-12-29
Total months	131
	Backtest
Annual return	8.0%
Cumulative returns	133.3%
Annual volatility	19.7%
Sharpe ratio	0.49
Calmar ratio	0.15
Stability	0.77
Max drawdown	-54.9%
Omega ratio	1.10
Sortino ratio	0.69
Skew	-0.05
Kurtosis	10.73
Tail ratio	0.93
Daily value at risk	-2.4%
Gross leverage	1.00
Daily turnover	0.1%
Alpha	-0.00
Beta	1.00

Table 5. SPY Backtest

Start date	2007-01-05
End date	2017-12-29
Total months	131
	Backtest
Annual return	2.5%
Cumulative returns	30.5%
Annual volatility	27.6%
Sharpe ratio	0.23
Calmar ratio	0.04
Stability	0.04
Max drawdown	-56.2%
Omega ratio	1.04
Sortino ratio	0.32
Skew	0.00
Kurtosis	10.39
Tail ratio	0.95
Daily value at risk	-3.5%
Gross leverage	1.00
Daily turnover	0.2%
Alpha	-0.05
Beta	1.18

Table 4. IXC Backtest

The above tables summarize the relationship between the two index trackers. In the first the energy sector has a beta of 1.18, representing some level of independence with the rest of the market. Associated with an annual volatility of 27.6%, the energy stocks were almost 8 % more volatile. Although, the effect seems to be intensified on cases of stress[2].

The linkage with the Chemmanur and Fulghieri (1997) is present. Energy stocks are more volatile and at the same time extremely profitable, exactly the scenario described by the authors' models.

[2] More details in the annexes, figure 1.

3.5 Daily Stock Price

As a main index of volatility for our research, the daily stock price was extracted within the pre-defined time window range. Therefore, we retrieved the data from the beginning of 2007 to the end of 2017, from the Quantopian platform, who is directly feed by Morningstar database.

The variable is composed by the variation on the stock price between t and t-1. On another words, it measures the average daily price changes on the stock price comparing it with the previous day. Figure 2 shows the dispersion of the stocks volatility between the years, grouped by offer type.

Although there´s an expected correlation between both groups, the variances are not steady for the whole period. Nonetheless, the equity-only group appears to be more subjectable to price fluctuation in most of the years. Interestingly, our sample of shares-only seems to have increase its average in the peak of the financial crisis. A deep analysis revealed that in fact the results are attributed to the colossal drop prices in 2008 that simply reversed to a near mean in late 2009. Moreover, the amount of companies that couldn't survive the crisis also influenced the jump in the average daily price change. Mainly because of the survivorship bias, where delisted companies no longer had negative variations on prices.

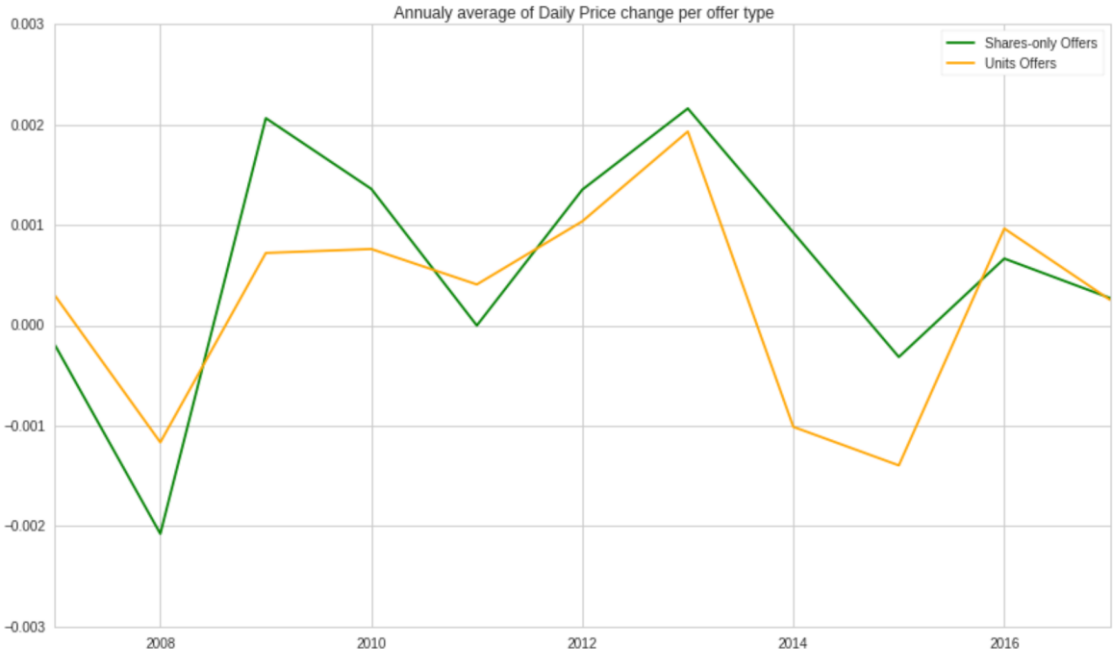

Figure 2. *Annual Average Daily Stock Price per offer Type - Source: Own elaboration*

Contradicting Chemmanur and Fulghieri (1997) prediction there's no evidences of higher future volatilities for equity-only companies in their stock-prices. Thus, Schultz (1993) main concept of improvement on Corporate Governance may be conceivable in the above scenario, where ex-ante worse corporate governance indicators are not translated into worse performance. Intrinsically connected with H5, the initial predictions point to an environment where share-only companies don't outperform the counterparty.

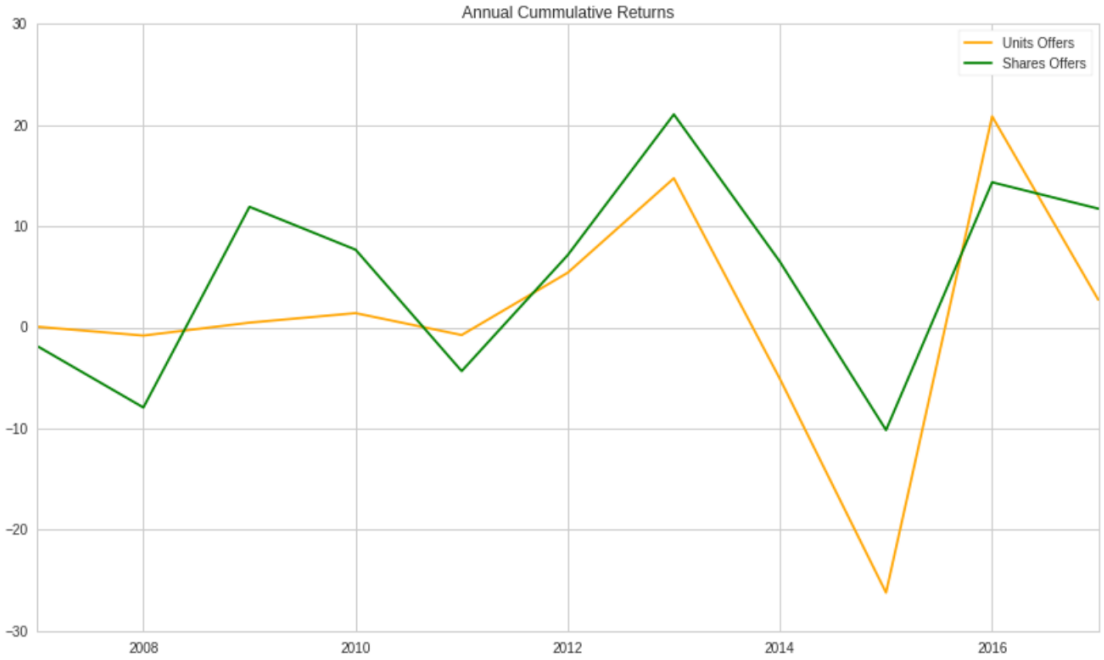

Figure 3. *Annual Cumulative Returns per offer type - Source: Own elaboration*

However, when a deep analysis on the cumulative returns takes place, it's noticeable that the performance doesn't seem to carry along with the daily variance. In fact, the evidences point to a general higher performance to the share-only sample.

The difference is not only graphically observable but empirically meaningful, where unit offers had a mean positive return of 13.8%, equated with a 52.1% of mean cumulative returns from Shares-only companies. The amount of companies delisted for each group is an important flag when assessing the general environment. With 44% of unit companies

being delisted at the end of 2017, compared with only 30% of equity-only firms without tickers in the main US markets, at the same time.

Although, both companies' groups have positive returns. The evidences appear to support H5, whereas the previous analysis portrays a different picture, where unit-companies underperform the competition. Chemmanur and Fulghieri (1997) theory, again, loses steam when both datasets are set side by side.

Moreover, the next chapters shall investigate the hypothesis with probabilistic models.

3.6 Methodology and Models

Although the previous sections enlighten our research and pointed for some unexpected results, a Probit analysis shall give additional arguments to each of the contrast theories and provide a probabilistic test to the aforethought hypotheses.

Prior-models it's necessary to assess the level of the correlation between the variables. In our study we defined our threshold level of 70% as acceptable to perform a Probit analysis, excluding interaction between independent variables with amount greater than it, in the same model. Promoting greater expected levels of significance in each model, avoiding redundancies.[3]

Moreover, the below correlation matrix, noised some associations with three flag points above the demarcated value. Starting with the Amount offered and ROA, the correlation reaches the 70%. The latter can be explained by the proportionality between size and capitalization goals. In another words, bigger companies target bigger amounts from the primary market.

Second there's evidences of high correlations, between the board size and the number of non-executives in the board. As reviewed in the previous chapter, the size of the board is intimately connected with the amount of independent member and non-executive officers.

The same assembly occur with the number of non-executives and independent members, whereby definition it should be closer to 100%, nonetheless, when accounting for the

[3] For more details refer to annexes, table 2

non-executive officer that have connections with the company but do not performing any executive position, the correlation decreases to around 80%.

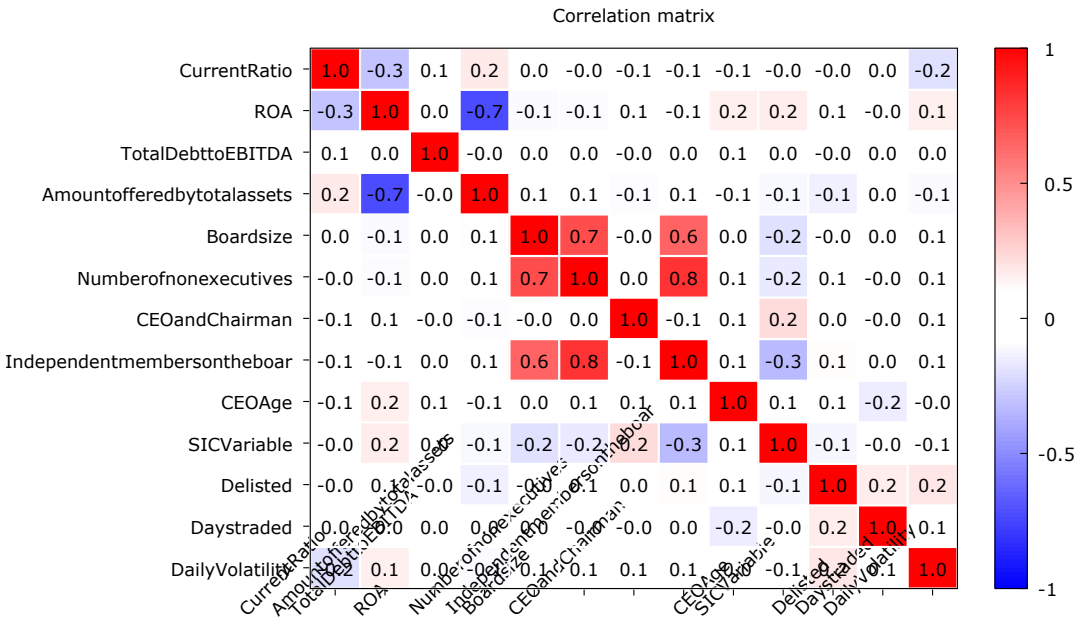

Figure 4. *Correlation Matrix between variables selected - Source: Own elaboration*

When analysing other significant correlations, there´s an interesting negative value that calls for attention. The relation between the energy SIC and the independence of the board is something to reflect about. At a first glance on the correlation matrix, the sector is ostensibly characterized by a positive movement with the performance proxy (ROA), a positive relation with the CEO Duality and negative correlation with the board independence.

Furthermore, there's also two other obvious correlation between ROA and the current ratio, where fundamentally the current liabilities are being measured against the performance proxy, producing a negative correlation between both.

In the next section a probabilistic model shall take place, in order measure the relation of the above variables and our dependent variable.

3.6.1 Probit Models

Aligned with the main intention of this study, the application of a Probit model aims to find evidences to explain why companies chose to go public with unit emission. Moreover, to test the 5 hypotheses rose in the previous chapter.

Before the application of the model itself, is important to recall that Probit models are atypical when it comes to the results. They measure the probability of a certain output conditioning the independent variables.

In what follows, this study shall model the conditional probability of each company to choose a unit emission. By way of explanation, the probability of a company to choose to go public, by means of units, is a function of a linear consolidation of the regressors, conditional to each one.

The above probability condition is represented by the equation 1. Where Φ represents the cumulative function of the standard normal distribution, again conditional to the independent variables.

$$\mathcal{P}[Yi = 1 \mid X_{1i}, \dots X_{Ni},\ \beta_0, .., \beta_N] = \ \Phi(\beta_0 + \sum_{n=1}^{N} \beta_n X_{ni}) \qquad \textbf{Equation 1}$$

The equation 2, show the linear combination between the regressor and the dependent variable.

$$Yi = X\beta + \ \varepsilon i; \qquad (i = 1, \dots ,\ N) \qquad \textbf{Equation 2}$$

Where Yi is defined as $Yi = \begin{cases} 1 \\ 0 \end{cases}$

When evaluating a Probit model, is important to recall that the interpretation of the coefficients should be carefully swotted. In opposition of a linear model, where the mean of the dependent variable can be interpreted as the linear combination of the regressors. The same is not applied to these probabilistic unit models. Probit models work in a different fashion, making the slopes to the mean, a more efficient way to read the impact of each variable in the binary output.

According Carmeron and Triveda (2010), the slopes to the mean, similarly known as the marginal effects, are the changing in the probability of the dependent variable, when we

change each individual variable to one unit while holding all the other variables at their means. In another words, it's a measurement of the impact that each independent variable has in the binary output, given by the probability of the change on the dependent variable when, separately, the mean of each variable is changed to 1 and 0.

$$Y^* = \beta 0 + \beta X1 + \beta X2 + \cdots + \beta_i + \varepsilon \quad \textbf{Equation 3.1}$$

$$Y^* = \beta 0 + \beta * 1 + \beta X2 + \cdots + \beta_i + \varepsilon \quad \textbf{Equation 3.2}$$

$$\mathcal{P}0 = \frac{e^{Y^*}}{1+e^{Y^*}} \quad \textbf{Equation 3.3}$$

$$Y^* = \beta 0 + \beta * 0 + \beta X2 + \cdots + \beta_i + \varepsilon \quad \textbf{Equation 3.4}$$

$$\mathcal{P}1 = \frac{e^{Y^*}}{1+e^{Y^*}} \quad \textbf{Equation 3.5}$$

$$Slope\ X1 = \mathcal{P}1 - \mathcal{P}0 \quad \textbf{Equation 3.6}$$

From the original equation 3.1, there's a transformation in the independent variable mean to a binary state, in the equation 3.2 and 3.4. Subsequently a reduction from the logarithmic preposition to a probability in equations 3.3 and 3.5.

Resulting in a final step to differentiate both states, giving the final slope to the mean to the variable X1. Meaning that its value will represent the probability of sate change to the dependent variable by 1 unit of change in X1. It's important to denote, that a negative slope doesn't translate a negative probability, but in contrast, signify the probability to alteration to state 0.

3.6.2 Models and conclusions

In this section, different models shall be analysed, testing the multiple hypothesis. It's worth to mention that all the below regressions were calculated with robust QML[4] standard errors.

Model 1.1 – General Model: Firm Characteristics and CG mechanisms

$$Offer\ Type = \beta 0 + \beta CURRENTRATIO + \beta TDEBTTOEBITDA + \beta OFFERSIZE + \beta BOARSIZE + \beta CEODUALITY + \beta BOARDINDEPENDENCE + \beta CEOAGE + \beta SIC + \varepsilon$$

Equation 4

Model 1.1: Probit, using observations 1-216

Dependent variable: Offer Type[5]	*Coefficient*	*Std. Error*	*z*	*Slope**	*p-value*	
Constant	0.695832	0.843944	0.8245		0.4097	
Current Ratio	−0.100924	0.0729177	−1.384	−0.039691	0.1663	
Total Liabilities to EBITDA	−0.00171042	0.00184769	−0.9257	−0.000672	0.3546	
Amount offered by totalassets	0.0505206	0.0417729	1.209	0.0198689	0.2265	
Board size	−0.100195	0.0419039	−2.391	−0.039405	0.0168	**
CEO Duality	0.391872	0.234389	1.672	0.152084	0.0945	*
Board Independence	−0.173118	0.0685002	−2.527	−0.068084	0.0115	**
CEOAge	0.00827320	0.0150509	0.5497	0.00325371	0.5825	
SIC Variable	1.99252	0.285730	6.973	0.616290	<0.0001	***
Number of cases 'correctly predicted' = 176 (81.5%)						
f(beta'x) at mean of independent vars = 0.393						
Likelihood ratio test: Chi-Square (8) = 132.484 [0.0000]						

Mean dependent var	McFadden R-squared	Log-likelihood	Schwarz criterion	S.D. dependent var	Adjusted R-squared	Akaike criterion	Hannan-Quinn
0.486111	0.442686	−83.394	215.1664	0.500968	0.382541	184.7888	197.0614

Table 6. *Multilevel dimensional Binary Probit analysis – Levels of significance: *** 1% ** 5% * 10%*

Table 4 measures the assertiveness of offer choice conditioned by the Firm Characteristic and Corporate Governance variable.

[4] Quasimaximum likelihood

[5] The dichotomous variable has a state equal to 1 for units offers and 0 for equity-only offers

After completing the probabilistic analysis, the results pointed out to an Adjusted R-Squared of around 38%, with 81.5% of the offer types correctly predicted. Herewith, showing some level of significance.

Moreover, the above equation outcome four significant variables. The SIC variable with the greatest level of significance, the board independence with a significance level of around 1.2%, the Board Size with a p-value rounding 1.7% and finally CEO duality with a value near 9.5%.

Although, it's observable that Current Ratio and Total liabilities by Total Assets have a negative influence, along with the positive effect of Offer Size and CEO age, neither of the two groups exhibited enough significance in the analysis. Implicating a small role in the offer choice. Nonetheless, the signal appears to be in line with Schultz (1993) prediction about the negative relation between risk and the choice of units, before offer. Whereas, our first proxy of risk, the current ratio, has a negative impact on the offer choice. In another words, the decrease of the current ratio, reflecting less liquidity, will increase the probability of units choice.

Undertaking the assumption that we established an alpha to a maximum of 10% of significance, the CEO duality becomes a mark to understand the formation of our offer choice. The results show that CEO duality explaining up to a 15.2% of probability of change on offer choice, per unit of change. In simple words, the greater the CEO Duality the greater the probability that a company will embrace a unit offer. Signalling again, a connection with Schultz (1993) theory, where the evidences show that the increase of a weak governance mechanism, CEO duality, will produce a growth on the probability of a package IPO.

Furthermore, aligned with the analysis on the descriptive statistics, the evidences show a negative relation between unit offers and Board Size. The interconnection is discernible, where a slope of around -4% represents an inverse relationship. In other words, the increase of one member in the board will conjointly increase the probability of state 0, equity-only offers.

Following with Board independence, the model illustrates evidences of an opposing behaviour between board independence and unit choice. The increment of one independent member, in the board, would be reflected as a rounding 7% increment of probably of an equity-only offer.

Lastly, SIC appears to be the most significant variable, with an astonish value of about 62% impact. Despite the fact, dummy variables always have larger slopes, due to their

intrinsically binary properties, the level of significance and influence still have the most substantial explanatory power in the equation.

Model 1.2 - General Model: Firm Characteristics and CG mechanisms (Optimized)

$$Offer\ Type = \beta 0 + \beta CURRENTRATIO + \beta ROA + \beta BOARSIZE + \beta CEODUALITY + \beta BOARDINDEPENDENCE + \beta CEOAGE + \beta SIC + \varepsilon$$

Model 1.2: Probit, using observations 1-216

Dependent variable: Offer Type	*Coefficient*	*Std. Error*	*z*	*Slope**	*p-value*	
Constant	0.741356	0.844209	0.8782		0.3799	
Boardsize	−0.105265	0.0423231	−2.487	−0.0418901	0.0129	**
Current Ratio	−0.0916244	0.0533207	−1.718	−0.0364618	0.0857	*
CEO Duality	0.394245	0.234789	1.679	0.155355	0.0931	*
CEOAge	0.00816116	0.0151558	0.5385	0.00324772	0.5902	
SIC Variable	2.01701	0.289445	6.969	0.642443	3.20e-012	***
Board Independence	−0.173694	0.0690914	−2.514	−0.0691212	0.0119	**
ROA	−0.154945	0.0886593	−1.748	−0.0616599	0.0805	*
Number of cases 'correctly predicted' = 177 (81.9%)						
f(beta'x) at mean of independent vars = 0.398						
Likelihood ratio test: Chi-Square (7) = 132.255 [0.0000]						

Mean dependent var	McFadden R-squared	Log-likelihood	Schwarz criterion	S.D. dependent var	Adjusted R-squared	Akaike criterion	Hannan-Quinn
0.486111	0.441921	−83.50900	210.0202	0.500968	0.388458	183.0180	193.9270

Table 7. *Multilevel dimensional Binary Probit analysis – Levels of significance: *** 1% ** 5% * 10%*

While optimizing the assessment, with the replacement of Offer Size for ROA, the results presented similar outcomes, with the number of cases 'correctly predicted' increased by one and a slightly larger R-Squared. In addition, ROA and Current Ratio showed as significant.

In fact, the previous statement imposes a more comprehensive connotation. With negative slopes, there're two crucial inferences connected with H1.

First, with an influence of around 3.6 % per each unit of change, the model 1.1 suggests that an increase in the Current Ratio[6] will produce an increased probability of equity-only choice. Substantiating Schultz (1993) statement about unit-offers being risker.

[6] An increase on Current Ratio implies less risk ($Current\ Ratio\ =\ Current\ Assets\ /\ Current\ Liabilities$)

Furthermore, ROA also displays a negative relationship with offer type, with a 6% increased probability of going public with share-only offers per each unit of change of ROA. Therefore, screening evidences for the second leg of H1.[7]

The above model shows strong evidences that H1 cannot be rejected. Aligning itself with previous empirical finding from Zhang (2010), Howe and Olsen (2009) and How et al. (2001).

[7] Optimized models can be found on table 4 of the annexes.

$$Offer\ Type = \beta 0 + \beta CURRENTRATIO + \beta BOARSIZE + \beta CEODUALITY + \beta BOARDINDEPENDENCE + \beta CEOAGE + \beta ROA + \beta ANNUALIZEDDAILYVOLATILITY + \varepsilon$$

Equation 5

Model 2: Probit, using observations 1-216

Dependent variable: Offer Type	*Coefficient*	*Std. Error*	*z*	*Slope**	*p-value*	
Constant	0.00776551	0.779831	0.009958		0.9921	
Board size	−0.0461221	0.0371713	−1.241	−0.0180102	0.2147	
Current Ratio	0.608809	0.287719	2.116	0.237733	0.0343	**
CEO Duality	0.544307	0.208837	2.606	0.212129	0.0092	***
CEO Age	0.0188680	0.0126243	1.495	0.00736775	0.1350	
Board Independence	−0.271577	0.0780633	−3.479	−0.106048	0.0005	***
ROA	0.213416	0.201445	1.059	0.0833363	0.2894	
Voltility	−0.584317	0.306848	−1.904	−0.228169	0.0569	*
Number of cases 'correctly predicted' = 147 (77.8%)						
f(beta'x) at mean of independent vars = 0.390						
Likelihood ratio test: Chi-Square (7) = 66.3818 [0.0000]						

Mean dependent var	McFadden R-squared	Log-likelihood	Schwarz criterion	S.D. dependent var	Adjusted R-squared	Akaike criterion	Hannan-Quinn
0.433862	0.256604	−96.15563	234.2452	0.496923	0.194755	208.3113	218.8177

Table 8. *Multilevel dimensional Binary Probit analysis – Levels of significance: *** 1% ** 5% * 10%*

Although, this study was conducted with the possibility of a potential lookahead bias, by means of the utilization of the annualized average Daily Volatility of the stocks. The main goal is to test the future volatility of the cash flows in the choice offer. As described in Chemmanur and Fulghieri (1997) theoretical scenario, unit-firms have more volatile expected future cash-flows.

Interestingly, volatility appears to be significant and inversely to unit-offers. The relationship seems negative, with a probability of change of around 22.8 % probability

change. Thus, for each unitary change on the annualized volatility, there is an incremented probability that companies choose equity-offers.

The evidences don't support H4, instead, they point to Schultz theory who proposes that units are used as a Corporate Governance mechanism.

It's also noticeable the significance of each Corporate Governance on the model, whereas Board Independence, CEO Duality and Current Ratio are all worth to mention.

Nonetheless, when it comes to explanatory power, this model loses steam, with an R-Squared of about 19%.

Model 3 - General Model: CG mechanisms

$$Offer\ Type = \beta 0 + \beta BOARSIZE + \beta CEODUALITY + \beta BOARDINDEPENDENCE + \beta CEOAGE + \varepsilon$$

Equation 6

Model 3: Probit, using observations 1-216

Dependent variable: Offer Type	*Coefficient*	*Std. Error*	*z*	*Slope**	*p-value*	
Constant	0.822802	0.729492	1.128		0.2594	
CEO Age	0.0148093	0.0121296	1.221	0.00590078	0.2221	
Independence	−0.246895	0.0684002	−3.610	−0.0983755	0.0003	***
CEO Duality	0.518087	0.195393	2.652	0.204398	0.0080	***
Boardsize	−0.0725335	0.0353100	−2.054	−0.0289011	0.0400	**
Number of cases 'correctly predicted' = 163 (75.5%)						
f(beta'x) at mean of independent vars = 0.398						
Likelihood ratio test: Chi-Square (4) = 67.9785 [0.0000]						

Mean dependent var	McFadden R-squared	Log-likelihood	Schwarz criterion	S.D. dependent var	Adjusted R-squared	Akaike criterion	Hannan-Quinn
0.486111	0.227145	−115.6472	258.1708	0.500968	0.193731	241.2944	248.1125

Table 9. *Multilevel dimensional Binary Probit analysis – Levels of significance: *** 1% ** 5% * 10%*

When we tested the explanatory power of the Corporate Governance mechanisms, we found evidences similar to model 2. Although the model has a lower R-Squared, due to regressors omission. It can be useful, to observe the marginal effect, where the coefficients dispersions are lower.

The evidences show, high levels of significance found in Board Independence, CEO Duality and Board Size. It's also worth to mention, that the Corporate Governance mechanism by itself have an Adjusted R-Squares of about 19.4%, explaining a big quantity of the model.

Moreover, the increase of one independent member in the board will increase the probability of equity-offers, likewise the effect in the board size has the same effect but in a smaller scale. An important point to be remark is the relation between both variables,

the impact of the increase of the board size on the decision is closely connected with the type of member that its being include. As the reviewed literature exhibited, Board Size increases can be beneficial to the firm CG specially if the member is an outsider.

Finally, CEO Duality is once again positively connected with the choice of Unit-IPOs. Whereas, the probability of alteration rounds 20.4% if the CEO also play the Chairman figure.

The above model displayed several indications in favour of H2 and H3, where lower CG factors are in concordance with the emission of units.

Model 4 - General Model: Volatility

$$Offer\ Type = \beta 0 + \beta ANNUALIZEDDAILYVOLATILITY + \beta DAYSTRADED + \beta SIC + \varepsilon$$

Equation 7

Model 4: Probit, using observations 1-216

Dependent variable: Offer Type	*Coefficient*	*Std. Error*	*z*	*Slope**	*p-value*	
Constant	−0.166331	0.254597	−0.6533		0.5136	
Annualized Daily Volatility	−0.235795	0.247300	−0.9535	−0.0932095	0.3403	
Days Traded	−0.000632528	0.0002113	−2.994	−0.00025004	0.0028	***
SIC	2.37942	0.271751	8.756	0.748491	2.03e-018	***
Number of cases 'correctly predicted' = 160 (84.7%)						
f(beta'x) at mean of independent vars = 0.395						
Likelihood ratio test: Chi-Square (3) = 108.866 [0.0000]						

Mean dependent var	McFadden R-squared	Log-likelihood	Schwarz criterion	S.D. dependent var	Adjusted R-squared	Akaike criterion	Hannan-Quinn
0.433862	0.420832	−74.91330	170.7936	0.496923	0.389908	157.8266	163.0798

Table 10. *Multilevel dimensional Binary Probit analysis – Levels of significance: *** 1% ** 5% * 10%*

The model 4, shall present a complete analysis on all the volatility proxies, while not presenting the full explanatory behaviour and already tested in model 2, the above model intends to clarify the role of volatility. Although it includes the number of trading day, another serious lookahead variable, the aim is to measure the influence of volatility in the offer choice.

It's crucial to review two main assumption: First, Energy SICs are being used an approximation of a company type described in Chemmanur and Fulghieri (1997) model, highly volatility and profitable. Second, the volumes of trading days define the maturity and consolidates the market sentiment about a stock, making it proportionally less volatile[8].

[8] No outiers or sensitive information releases are being considered

In consideration with the above model, the annualized volatility now shows low levels of significance with a p-value of around 34%, crossing the alpha barrier of 10%.

On the other hand, the volume of trading days and the SIC variable express high levels of implication, both, with p-values underneath 1%. Remarkably, together they yield a model with an R-Squared of around 39 % and with a rate of predictable cases of 84.7%.

Weighting their impact, the increase on the volume of days trading, translates itself in a higher probability of equity-only emission. With an increased probability of 2 basis points. Even though, the value is very low, it's important to notice that the increase of one trading day in a panoply of 10 trading years is trading is arguably modest.

Moreover, the SIC shows similar results as the previous model 1. With a marginal effect of 74%. The value must be interpreted with caution, since the variable has dummy properties and a slope to the mean can't be translate as a continuous change to its mean. However, its presence and relevance are unquestionable. As well as the positive relation with unit-IPOs.

As a matter of fact, the former statement can be explored in detailed if we drop the assumption that Energy SICs are a proxy for volatility and alternatively reasoning its own identity as an independent factor. However, that analysis is currently out of the scope of this thesis and it's unspoilt to future investigations.

Back on topic, the model offers a supplementary view about two contradictory variables. In one side, the increase of SIC that appears to explain a great amount of the offer choice, on the other hand, our measures of volatility that seem to have a negative relationship with the unit's choice.

As a humble explanation, we can ponder that although the energy sector has high volatility on its future expected cash flows, doesn't mean that they cannot hedge them, with an efficient management style.

In the previous scenario, we can consider the SIC as a predictor of volatility and the amount of trading days and daily volatility as the realization.

However, the arguments contradict H4, once more.

3.6.3 Failing rate

A final analysis on distribution of the IPO dates and the failing ratios, presented some contradictory evidences.

The results exhibited a percentage of 44% unit offers, against 30 % of Share-only delisted.

As a per below visualization, on the distribution of companies' listings, it's possible to infer two several points:

First, the environment for both types of initial public offers seems to have improved, since the 2008 financial crisis. Not only the total amount of offers increased after 2010, but their average life span was also enlarged. Both groups appear to be relishing on the high positive market time.

Nonetheless, when a closer look on the downwards side is given, the evidences displayed that units IPOs were close to zero near the recession, raising questions on their existence and utility on bear market conditions.

Second, H6 appears to be on track with the results. Whereas, unit IPO fail, in average, in a superior percentage than equity-only IPOs.

Nonetheless, when we include the falling rate as a binary variable in our models.[9] It doesn't seem to increase the explanatory power of the model or be significant as per se.

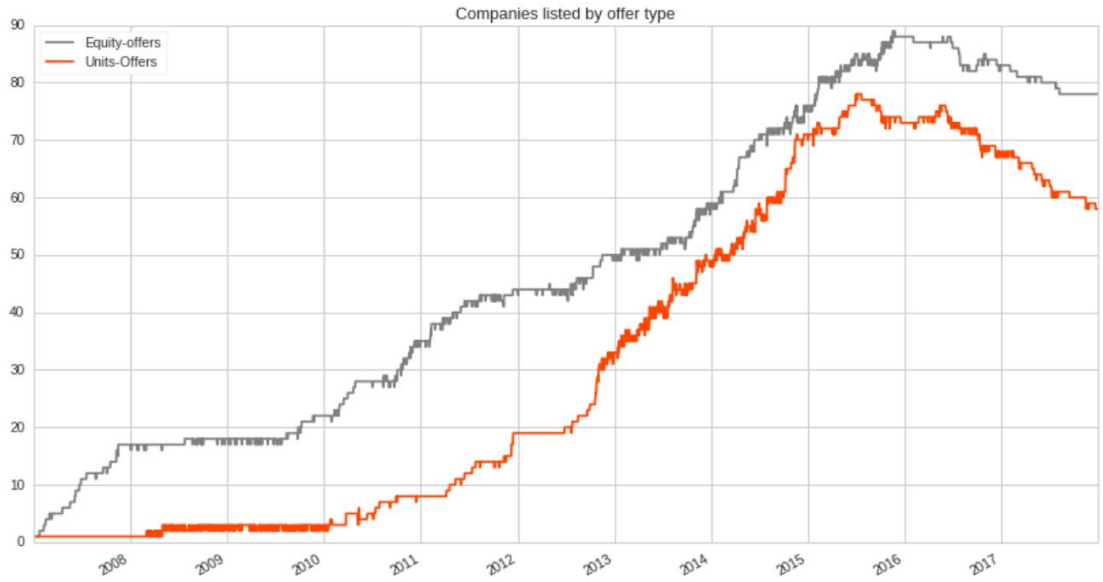

***Figure 5**. Companies distributions by year - Source: Own elaboration.*

[9] Refer to Model 5, in the annexes, table 4.

Chapter 4

IV Conclusions

This research endeavour to connect a point of agreement between two fundamental theories about Unit-IPOs. From one side, the Agency Cost Theory, that describes the aforementioned form of capitalization, as a substitution of other Corporate Governance mechanisms. Distinctly, the Signalling Theory suggests a setting where Units companies are already well managed and adopt this offer type as an approach to noteworthy their quality.

Sequentially, to find empirical indications on the matter the thesis was broke down into four main branches.

First, the spotlight was directed to the firm characteristics and the environment ex-ante public offer. With a descriptive analysis followed by an application of a probabilistic model, Probit. This research found strong indications that companies who emit Unit-IPOs are smaller and riskier.

Harmoniously in concordance with the previous literature, the findings were not unexpected. Ipso facto, both the classic theories cemented their foundations in that belief.

Second, this study examined the implications of each Corporate Governance mechanism in the company offer choice. As predicted by the Agency Cost Theory, the evidences suggested that Unit firms have weaker mechanisms in practice, nonetheless they don't appear to be outperformed by equity-only companies. Hence, enhancing preceding findings about the main assumption that Units can act as corporate governance tools.

Third, volatility. Prevailing as a key principle to understand the incentives of unit offers. The analysis shaped two stages. Initially, we proceed to the analysis of the stock prices daily volatility. Whereas, the results displayed weak links with the framework proposed by the Signalling theory. Furthermore, the Probit analysis stretched the same conclusion.

Interestingly, although the Energy SIC was employed to mimic the latter theory and variable, it revealed an astonishing association with Unit offers. One inference may be the relation with the Agency Cost Theory instead. Where companies, after offer, seem to have polished their management styles. Allowing them to hedge the initial adverse conditions.

Comparable, with the monitoring pressure from the debtholders and the staged finance prearranged by Venture Capitalists, units may act in the same style. When we consider that the company can only realize its full potential market capitalization if the warrants are exercised. It's logical to reason that managers have large incentives to perform at their highest.

Lastly, the analysis on the performance and survival rates of each group, revealed that although unit offers have been historically less resilient than the competitor set. With a clear underperformance when equated against equity-only companies. Nevertheless, the difference didn't seem to be relevant when accounting its explanatory power on the offer choice.

Summarizing, the research found strong indications that both theories have solid arguments when assessing the causality of such offer types. Although, Schultz (1993) Agency Cost Theory was undoubtedly in line with most of our findings. The Signalling Theory was also extant in the results, with the relation between the Energy SIC and the choice of units.

Moreover, the effect of other external factors elusive to this study and the current literature, may still be a strong possibility.

4.1 Limitations

As a common problematic topic rose by several authors, such as How (2001) and Zhang (2010). The data limitations, due to the small amount of Unit IPOs, can have

compromised the significance levels of our models. Not only the sample size, has extremely low, but the classifications of such offers are submissive on most databases, leading to a manual correction process.

Furthermore, the models had high estimated errors, that opens the doors for the possibility of different variables as explanatory of the offer choice. Foremost, the size proxy could have been different and differently adjusted to the company's assets intensity. The Corporate Governance approximations could also have been chosen differently, including variables such as the board tier systems.

4.2 Extensions for future research

Amidst the several possibilities to the continuity of the units offer study. The most glistening is the explanatory power of the energy SIC in the offer choice. A comprehensive analysis on the topic may be interesting to explain this not so common issues.

Moreover, as itemized in the previous chapter, the relation and utility of unit-offers appears to be submissive in bear markets, such as the 2008 financial crisis. Probing the latter, can provide additional evidences to the literature.

Lastly, the scarcity of data may be overcome if the future study includes Seasoned offers. Although, it can compromise the validation of Schultz (1993) theory, its analysis can prove to be helpful to understand the mechanisms that rule the units offer choice. As pointed by Byoun (2004), unit seasoned equity offerings can provide a wider spectrum of information. There are two points that make USEOs very useful to the research:

Firstly, Unit IPOs are in essence IPOs, meaning that their time in the market is null, entangling the minimum information required by the regulator. Even though the availability of such information should be totally released, there are not yet analysts following the companies making the information very difficult to access.

Secondly, these categories of IPOs are decreasing, both types of offerings are currently in extinction. Meaning that there are less offerings to analyse.

V Appendix

5.1 SIC explanation

SIC
Energy
Natural Gas Transmission
Petroleum Bulk Stations And Terminals
Coal Mining Services
Crude Petroleum And Natural Gas
Cogeneration, Alternative Energy Sources
Bituminous Coal And Lignite Surface Mining
Petroleum Refining
Oil And Gas Field Services, Not Elsewhere Classified
Marine Cargo Handling
Petroleum And Petroleum Products Wholesalers, Except Bulk Stations And Terminals
Miscellaneous Non-metallic Minerals, Except Fuels
Deep Sea Domestic Transportation Of Freight
Products Of Petroleum And Coal, Not Elsewhere Classified
Deep Sea Foreign Transportation Of Freight
Electric Services
Natural Gas Transmission And Distribution
Pipelines, Not Elsewhere Classified
Crude Petroleum Pipelines
Drilling Oil And Gas Wells
Fuel Oil Dealers

Table 1. *All the above Keywords were chosen to build the variable Energy SIC – Source: Own elaboration*

5.2 Energy SIC proxy on Stress events

Figure 1. *IXC on Stress Events - Source: Quantopian Platform*

5.3 Correlations

Correlation coefficients, using the observations 1 - 216

CurrentRatio	ROA	TotalDebttoEBITDA	Amountoffered bytotalassets	Boardsize	
1.0000	-0.3056	0.0622	0.1684	0.0147	CurrentRatio
	1.0000	0.0299	-0.7333	-0.1088	ROA
		1.0000	-0.0421	0.0289	TotalDebttoEBITDA
			1.0000	0.0972	Amountoffered bytotalassets
				1.0000	Boardsize
Numberofnonexecutives	CEOandChairman	Independentmembersontheboar	CEOAge	SICVariable	
-0.0373	-0.0552	-0.0576	-0.0725	-0.0274	CurrentRatio
-0.1042	0.0752	-0.0716	0.1505	0.1594	ROA
0.0256	-0.0409	0.0143	0.0633	0.0212	TotalDebttoEBITDA
0.0886	-0.0991	0.0634	-0.0908	-0.1193	Amountoffered bytotalassets
0.7261	-0.0145	0.6478	0.0040	-0.2022	Boardsize
1.0000	0.0224	0.8181	0.0618	-0.1701	Numberofnonexecutives
	1.0000	-0.0871	0.0572	0.2165	CEOandChairman
		1.0000	0.0672	-0.3392	Independentmembersontheboar
			1.0000	0.0726	CEOAge
				1.0000	SICVariable
		Delisted	Daystraded	DailyVolatility	
		-0.0254	0.0334	-0.2035	CurrentRatio
		0.0554	-0.0143	0.1474	ROA
		-0.0179	0.0101	0.0152	TotalDebttoEBITDA
		-0.1465	0.0371	-0.1108	Amountoffered bytotalassets
		-0.0266	0.0066	0.0949	Boardsize
		0.0922	-0.0428	0.0626	Numberofnonexecutives
		0.0154	-0.0188	0.0742	CEOandChairman
		0.1031	0.0148	0.0942	Independentmembersontheboar
		0.0715	-0.1567	-0.0165	CEOAge
		-0.1247	-0.0081	-0.0519	SICVariable
		1.0000	0.1572	0.1799	Delisted
			1.0000	0.0661	Daystraded
				1.0000	DailyVolatility

Table 2. *Correlations table - Source: Own elaboration*

5.4 Optimized models

Model 1.3 - General Model Optimized

Model 1.3: Probit, using observations 1-216

Dependent variable: Offer Type	*Coefficient*	*Std. Error*	*z*	*Slope**	*p-value*	
Constant	0.300472	0.474007	0.6339		0.5261	
Boardsize	−0.0811808	0.0459884	−1.765	−0.0320230	0.0775	*
Current Ratio	0.740940	0.323657	2.289	0.292275	0.0221	**
CEO Duality	0.405935	0.258225	1.572	0.159911	0.1159	
Board Independence	−0.202598	0.0741948	−2.731	−0.0799177	0.0063	***
ROA	0.0283388	0.139001	0.2039	0.0111787	0.8385	
SIC Variable	2.23965	0.311197	7.197	0.724150	6.16e-013	***
Volatility	−2.70469	4.67656	−0.5784	−1.06691	0.5630	
Number of cases 'correctly predicted' = 163 (86.2%)						
f(beta'x) at mean of independent vars = 0.394						
Likelihood ratio test: Chi-Square (7) = 133.877 [0.0000]						

Mean dependent var	McFadden R-squared	Log-likelihood	Schwarz criterion	S.D. dependent var	Adjusted R-squared	Akaike criterion	Hannan-Quinn
0.433862	0.517513	−62.40798	166.7499	0.496923	0.455664	140.8160	151.3224

Table 3. *Multilevel dimensional Binary Probit analysis – Levels of significance: *** 1% ** 5% * 10%*

Model 5 – Introduction of a Delisted variable

$$Offer\ Type = \beta 0 + \beta CURRENTRATIO + \beta ROA + \beta BOARSIZE + \beta CEODUALITY + \beta BOARDINDEPENDENCE + \beta CEOAGE + \beta ROA + \beta ANNUALIZEDDAILYVOLATILITY + \beta Delisted + \varepsilon$$

Model 5: Probit, using observations 1-216

Dependent variable: Offer Type	*Coefficient*	*Std. Error*	*z*	*Slope**	*p-value*	
const	0.779512	0.851753	0.9152		0.3601	
Current Ratio	−0.0894248	0.0504924	−1.771		0.0766	*
ROA	−0.142681	0.0804486	−1.774		0.0761	*
Board Size	−0.102442	0.0422817	−2.423		0.0154	**
CEO Duality	0.417195	0.237017	1.760		0.0784	*
Board Independence	−0.171933	0.0695323	−2.473		0.0134	**
CEO Age	0.0102326	0.0152823	0.6696		0.5031	
SIC Variable	2.00484	0.294602	6.805		1.01e-011	***
Delisted	−0.283104	0.236543	−1.197		0.2314	
Number of cases 'correctly predicted' = 176 (81.5%)						
f(beta'x) at mean of independent vars = 0.398						
Likelihood ratio test: Chi-square(8) = 133.65 [0.0000]						

Mean dependent var	McFadden R-squared	Log-likelihood	Schwarz criterion	S.D. dependent var	Adjusted R-squared	Akaike criterion	Hannan-Quinn
0.486111	0.446582	−82.81152	214.0005	0.500968	0.386436	183.6230	195.8956

Table 4. *Multilevel dimensional Binary Probit analysis – Levels of significance: *** 1% ** 5% * 10%*

5.5 Daily Price Distibutions

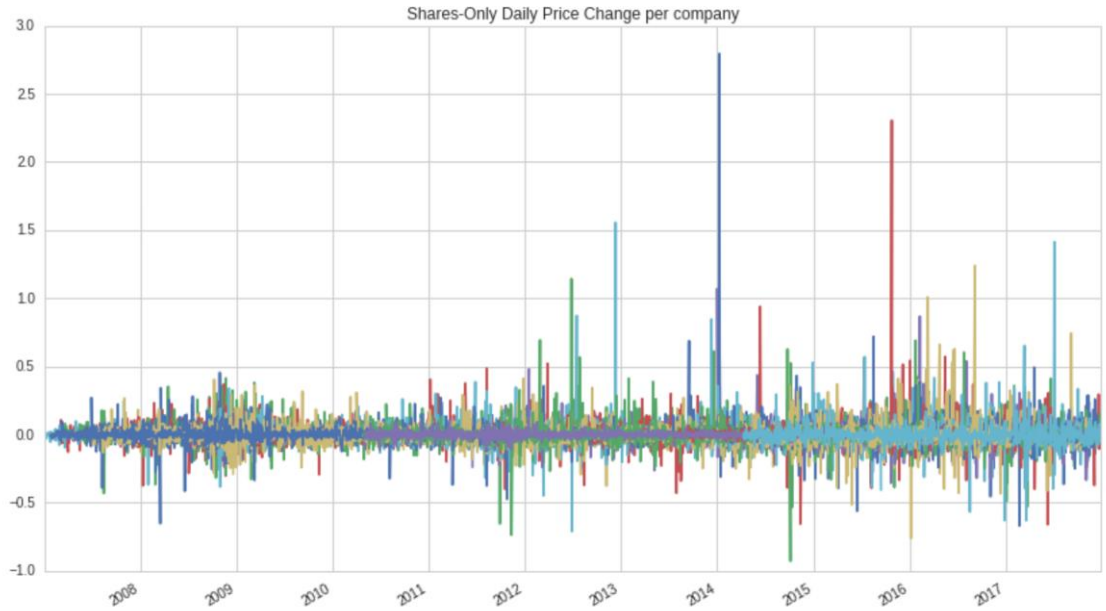

Figure 2. *Share-only companies daily price change frquencies by company - Source: Own elaboration*

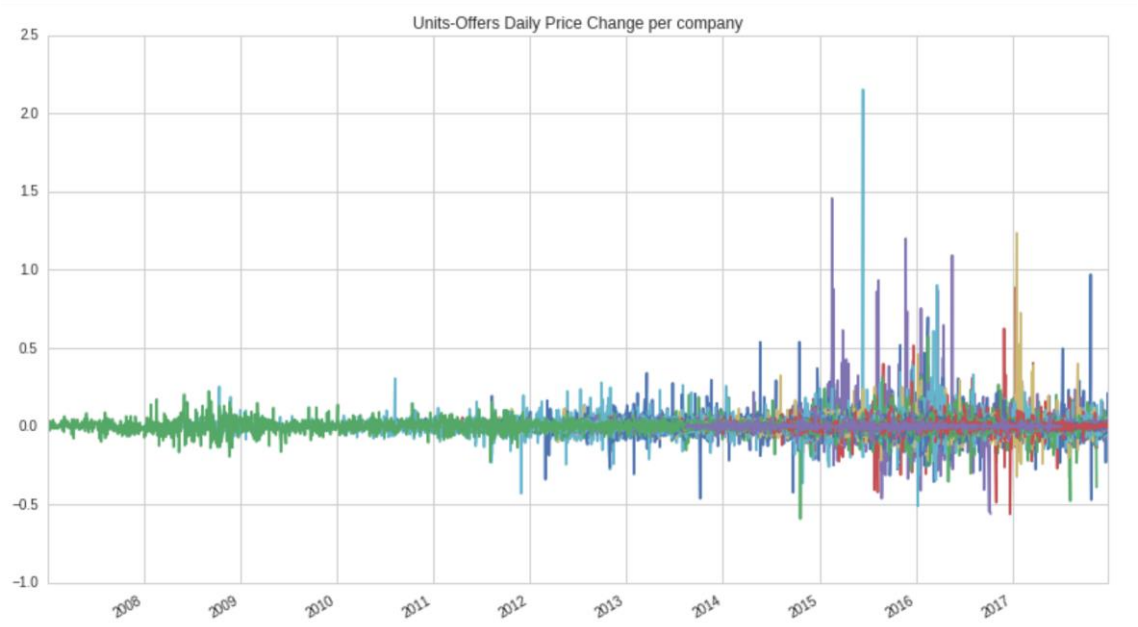

Figure 3. *Share-only companies daily price change frquencies by company - Source: Own elaboration*

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